#14/Paper 5-2-03

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Douglas CLAFFEY *et al.*

Appln. No.: **09/332,760**

Atty. Dkt. No.: 2493

Filed: June 14, 1999

Group Art Unit: 2123

Conf. No.: 3302

Examiner: H. Jones

Title: *Method And Apparatus For Determining Obscuration Of Sensors That Are Mounted On A Spacecraft*

RECEIVED
APR 2 2 2003
Technology Center 2100

* * * * * * * * * * * * * * * * * * * *

DECLARATION OF RICHARD J. RABBITZ
UNDER 37 C.F.R. § 1.132

* * * * * * * * * * * * * * * * * * * *

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

I, Richard J. Rabbitz, declare as follows:

My educational background is in the field of computer science. In 1982 I received a B.S. in Computer Science from West Chester University, and in 1991 I received an M.S.E. in Computer Science from the University of Pennsylvania. My Master's Thesis at University of Pennsylvania was focused on fast collision detection algorithms, and my faculty adviser was Dr. Norman I. Badler.

Agrees essential

I have authored the following papers in the field of computer science:

- Richard Rabbitz. Applying Visualization Technology to Simulation Based Design, *Systems Engineering And Software Symposium Proceedings*, New Orleans, May 1998.
- Richard Rabbitz and Tim Broderick. Applying Computer Graphics to 21st Century Naval Design. Presented at *SGI EXPO East*, Washington, DC, January 18-20, 1994.
- Richard Rabbitz. Fast Collision Detection of Moving Polyhedra. *Graphics Gems IV*, Academic Press, Boston. 1994, pp. 83-109.
- Tom Congdon, Jerry Golub, Richard Rabbitz, and Joe Walsh. Dynamic Visual Simulation to Aid Ship Design. Presented at *Summer Simulation Conference*, July 1992.
- Richard Rabbitz, Steve Alessandrini, Eric Halpern, and Deborah Hill. DDG Sonar Control Room, *SIGGRAPH'92 Industry/Application Slide Set*, July 1992.
- Richard Rabbitz, Eric Halpern, Deborah Hill, and Doug Lynn. Combat Information Center. *SIGGRAPH'92 Industry/Applications Slide Set*, July 1992.
- Richard Rabbitz. *Fast Collision Detection of Complex Dynamic Environments*, Master's thesis, University of Pennsylvania, Philadelphia, Pennsylvania, December 1991.
- Tim Broderick, Jerry Golub, and Richard Rabbitz. Vision Simulation for Ship Integration and Design. *Summer Simulation Conference Proceedings*, July 1990, pp. 525-530.

My work experience has been as a computer scientist, particularly in developing simulation and visualization software. I am currently employed by Lockheed Martin, and since 2001 I have served as Lockheed Martin's Technical Director of Design Simulation Group. Since 2000 I have taught at West Chester University as an Adjunct Professor in the Computer Science Department. I also worked for Lockheed Martin from 1982 to 1999 as the Technical Director of Advanced Visualization Group. From 1999 to 2001 I was employed by Analytical Graphics, Inc. as a Computer Graphics Programmer.

I have carefully reviewed the disclosure of the above-identified 09/332,760 patent application (hereinafter the '760 application) as it was originally filed, including the description, claims, abstract, and drawings.

I have carefully reviewed U.S. Patent no. 5,864,489, issued Jan. 14, 1999 (hereinafter, the '489 Patent).

I have carefully reviewed portions of published software product documentation entitled *STK User's Manual: Version 4.0.5 for Engineering Workstations* (hereinafter, the STK Manual) and *STK/VO User's Manual: Version 3.0 for Engineering Workstations* (hereinafter, the STK/VO Manual), which were both published

January 1999, including portions related to sensor definition, pointing and visualization.

I am familiar with the level of skill of persons working in the art of computer programming of software for spacecraft modeling (hereinafter, the relevant art) at the time the '760 application was filed, June 14, 1999, including persons of ordinary skill in the relevant art.

I observe that the '489 Patent teaches representation of a satellite in orbit about the Earth via an animated three-dimensional visualization of the satellite. *See* the '489 Patent at col. 3, line 43 through col. 4, line 34.

I observe that the '760 application teaches the step of selecting a view perspective from a sensor object along its boresight in the context of an animated three-dimensional visualization. *See* the specification of the '760 application at page 11, lines 18-21. This teaching of a vantage point in space and a direction of view from that vantage point would have been understood by a person of ordinary skill in the relevant art as being sufficient information to define a view vector in three dimensions.

I observe that the '760 application teaches selecting objects of the satellite system analysis scenario that are capable of causing obscuration. *Id.* page 12, lines 1-2.

I observe that the '489 Patent discloses a three-dimensional visualization wherein the general concept of how to carry out object selection is taught (albeit for different purposes than in the '760 application). *See* the '489 Patent at col. 3, lines 54-59.

I observe that the '760 application teaches the step of assigning a color to the selected, relevant objects, while another color is assigned to irrelevant objects and background. *See* the specification of the '760 application at page 12, lines 3-4.

I observe that the '489 Patent discloses how to assign colors to objects in the context of a three-dimensional visualization. *See* the '489 Patent at col. 3, lines 49-55. Persons having ordinary skill in the relevant art would have well understood the arbitrary nature of colors of representation and would have had no trouble selecting colors, or a lack of color (null color), to represent or suppress various objects, or, in the case of background objects, omitting to draw such

objects, as needed to achieve a particular aim of a three-dimensional visualization.

I observe that the '760 application teaches that the sensor pattern is a spherical projection. *See* the specification of the '760 application at page 9, lines 6-7. I further observe that the STK Manual teaches how to define (or "create") sensor patterns for sensors to be modeled. *See* the STK Manual at pages 12-3 through 12-14 (especially pages 12-10 and 12-11). I further observe that the STK Manual and STK/VO Manual teach how to cause a sensor projection to be displayed for a user to view. *See* the STK Manual at pages 12-31 through 12-33; the STK/VO Manual at pages 4-3 through 4-5. I further observe that the STK Manual teaches that sensors have a natural coordinate frame where the Z+ axis is the sensor boresight and the X and Y axes form a plane perpendicular to the boresight. *See* the STK Manual at page 12-15. These teachings of the meaning and usefulness of a sensor pattern would have been interpreted by a person of ordinary skill in the relevant art as being sufficient information to understand that a sensor pattern is a spherical projection that is an image produced by visual simulation software to model a sensor's view.

I observe that the '760 application teaches assigning a third color to the sensor pattern, such that, when the sensor pattern is superimposed over a visual display of a satellite system analysis scenario, portions of the sensor pattern that overlap with unselected objects and background appear in a different color than do portions of the sensor pattern that overlap with selected objects. *See* the specification of the '760 application at page 12, lines 5-8. The '760 application further teaches an example of how to accomplish superimposing by performing a logical exclusive OR function for the pixels in the visualization. *Id.* at page 9, lines 20-23.

In view of the foregoing factual observations, it is my opinion, to a reasonable degree of software engineering certainty, that 440 man-hours would have been needed for a team of computer programmers (or a lone programmer) of ordinary skill level in the relevant art, to code and debug a working software module to embody the invention as claimed in the '760 application, as amended, at the time the application was filed. In arriving at this opinion I assume that the coding would be done using an ordinary modern computer language and Application Program Interface (API), such as C and OpenGL, respectively,

that a computer programmer of ordinary skill in the relevant art would have been reasonably expected to be proficient with.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 6/24/2002 By: Richard J. Rabbitz
Richard J. Rabbitz

Vita of Richard J. Rabbitz

Principal Member of Engineering Staff
Lockheed Martin
Moorestown, NJ 08054
856-866-6685, richard.j.rabbitz@lmco.com

Degrees:
BS 1982 Computer Science, West Chester University
MSE 1991 Computer Science, University of Pennsylvania

Professional Employment:
Lockheed Martin, Technical Director of Advanced Visualization Group, 1982-1999
Analytical Graphics Inc., Computer Graphics Programmer, 1999-2001
Lockheed Martin, Technical Director of Design Simulation Group, 2001-present
West Chester University, Adjunct Professor Computer Science Department, 2000-present

Research Summary:

Master of Science Thesis at University of Pennsylvania in fast collision detection algorithms; this research involved designing an algorithm that used time coherence to compute collision detection events of moving convex polyhedra using a stable iterative solution. The research also included an algorithm for collision event scheduling for environments with thousands of objects based on time-speed constraints. The basic idea is at each simulation time step only check the objects that could possibly be close to each other given their speed and distance at the last time step. My adviser was Dr. Norman I. Badler.

Honors:
1984 – Technical Excellence Award
1992 – Engineering Excellence Award
1993 – Good Sourcing Award
1994 – Member of Group AEGIS Excellence Award
1994 – Government Electronics Author of the Year
1995 – American Society of Naval Engineers Award
1996 – Member of Group AEGIS Excellence Award
1997 – Team Recognition Award
1998 – Center Excellence Award
2001 – Technical Operations Team Award

Publications:
Richard Rabbitz. Applying Visualization Technology to Simulation Based Design, *Systems Engineering And Software Symposium Proceedings*, New Orleans, May 1998.

Richard Rabbitz and Tim Broderick. Applying Computer Graphics to 21st Century Naval Design. Presented at *SGI EXPO East*, Washington, DC, January 18-20, 1994.

Richard Rabbitz. Fast Collision Detection of Moving Polyhedra. *Graphics Gems IV*, Academic Press, Boston. 1994, pp. 83-109.

Tom Congdon, Jerry Golub, Richard Rabbitz, and Joe Walsh. Dynamic Visual Simulation to Aid Ship Design. Presented at *Summer Simulation Conference*, July 1992.

Richard Rabbitz, Steve Alessandrini, Eric Halpern, and Deborah Hill. DDG Sonar Control Room, *SIGGRAPH'92 Industry/Application Slide Set*, July 1992.

Richard Rabbitz, Eric Halpern, Deborah Hill, and Doug Lynn. Combat Information Center. *SIGGRAPH'92 Industry/Applications Slide Set*, July 1992.

Richard Rabbitz. *Fast Collision Detection of Complex Dynamic Environments*, Master's thesis, University of Pennsylvania, Philadelphia, Pennsylvania, December 1991.

Tim Broderick, Jerry Golub, and Richard Rabbitz. Vision Simulation for Ship Integration and Design. *Summer Simulation Conference Proceedings*, July 1990, pp. 525-530.